



Department of Homeland Security

Assessment Report

Responder Assessment and Validation
of User Equipment (RAVUE)

Non-Motorized Extrication Devices

*Submitted by:
Center for Domestic Preparedness
Office for Domestic Preparedness
61 Responder Drive, PO Box 5100
Anniston, Alabama 36205*

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1. OVERVIEW OF RAVUE

The Responder Assessment and Validation of User Equipment (RAVUE) is executed by the Center for Domestic Preparedness (CDP) in support of the System Assessment and Validation for Emergency Responders (SAVER) program under the supervision of the Office for Domestic Preparedness (ODP). RAVUE and SAVER are nationally focused programs designed to provide both immediate and long term contributions to Federal, State, and Local Responders by providing "user focused" information on weapons of mass destruction (WMD) response capabilities. Long term goals include assisting equipment and decision support developers in refining or improving Homeland Security capabilities, based upon Responder feedback on currently fielded WMD protection equipment and procedures.

2. ASSESSMENT PLAN OBJECTIVE

The first CDP equipment evaluation under the RAVUE program was the user assessment of non-motorized extrication equipment using standardized weapons of mass destruction (WMD) scenarios. An assessment plan was developed, equipment was procured, and the assessment took place on 23-25 June 2004, at the CDP main complex at McClellan, Alabama.

The evaluation criterion for this assessment was based upon the recommendations of the expert Responder Focus Group that met at the CDP on 7 April 2004. The Assessment Plan, Extrication Devices Market Survey, and the Analysis Report are hyperlinked to this report for easy reference.

3. METHODOLOGY FOR EQUIPMENT PROCUREMENT

Several solicitation methods described in Section 10.002 of the Federal Acquisition Regulation were employed to identify manufacturers of extrication devices. Methods included an extensive Internet search, a review of applicable response equipment catalogs and other product literature published by manufacturers, as well as personal interviews with emergency responders. In March 2004 a Sources Sought Notice was posted on the vendors Federal Business Opportunity website with a thirty day suspense. Additionally, letters were sent to twenty-six vendors inviting them to nominate their extrication devices for RAVUE assessment.

4. EVALUATION CRITERIA

Based on Focus Group discussions, the following evaluation measurements were recommended for evaluation of WMD response extrication equipment. These criteria are listed in order of significance, beginning with those judged to be of greatest importance. Principle evaluation criteria for the Extrication Devices Assessment will be high priority items, although information on other evaluation points are included in the final report for information purposes.

A. HIGH PRIORITY EVALUATION CRITERIA

Evaluation elements identified as high priority characteristics:

- Ease of Use (Patient Packaging/Movement)
- Lightweight
- Portability
- Durability (Non-reactive/Re-Usable/Multiple Extractions[Same Event])
- Multiple Environments (Vertical/Horizontal)
- Ease of Decontamination (Rinsable/In hot zone)

B. MEDIUM PRIORITY EVALUATION CRITERIA

Criteria identified as moderately important, but of lesser priority than the group above:

- Equipment Compatibility (Interaction with other types of equipment)
- Cost
- Easy to Assemble (Color Coded)
- Storage

C. LOW PRIORITY EVALUATION CRITERIA

Evaluation criteria identified as low priority items, which is information that might be of marginal utility in making local procurement decisions:

- Inter-agency Compatibility
- Sizability (Infant/Adult)
- Simple/Clear Instructions or Diagram (International)
- Recoverable
- Disposable

5. ITEMS TO BE ASSESSED

Of the twenty-six companies contacted that produce extrication devices, nine vendors responded. See the RAVUE Extrication Devices Market Survey for the list of manufacturers contacted. In addition, four companies responded to the Sources Sought Notice posted on the Federal Business Opportunity website. From these manufacturers, nine devices were selected for RAVUE assessment.

A. NOMINEES

The products nominated were organized into three movement categories:

- Drag-type devices
- Carry devices
- Extrication chairs

Two manufacturers—Rapid Deployment, Inc., and Henley Boards, Inc.—nominated more than one device for RAVUE assessment. However, in analyzing the individual nominations, it was noted that in several cases a manufacture had several models that were essentially identical in design and/or function as they might be used under RAVUE assessment conditions. Therefore, the CDP recommended that a “top-of-the-line” model from these vendors be assessed.

B. SELECTED DEVICES

The extrication devices selected are pictured below and are listed in Table 5.1 on the following page. They consist of five carry devices, three drag devices, and one extrication chair.



Table 5.1. Selected Extrication Devices

Company	Model
Activeaid, Inc.	#40B4C.I.D. Spineguard®
Arizona Industries for the Blind	Decontaminable Folding Pole Litter
Hartwell Medical Corporation	CombiCarrier®
Henley Board, Inc.	Henley Spinal Immobilization Device HB 1010
LifeSlider, Inc.	LS100 LifeSlider
Rapid Deployment Products, Inc.	Pro-Lite Spineboard® (716)
Red Sled, Inc.	RED SLED
Skedco, Inc.	HMD Sked®
Stryker Medical	Model 6253 Evacuation Chair

6. ASSESSMENT EQUIPMENT TRAINING

Evaluators were familiarized with each of the assessed devices prior to the test day. For example, Evaluators were provided equipment instruction material on the devices and practiced with the devices on the day prior to testing. The familiarization was conducted in an environment similar to that used during the assessment; however, familiarization was not carried out at the assessment location, nor were the evaluators wearing Level A Personal Protective Equipment (PPE).

7. ASSESSMENT PROCEDURES

During the assessment, Evaluator teams extricated non-ambulatory casualties from first and second floor structures and moved them approximately 70 yards from the building to a decontamination point. At the decontamination point, the victims were processed and passed to the simulated decontamination team. The Evaluator teams took the same extrication device and returned to the incident site to extricate the next casualty.

To ensure objectivity, all devices were assessed by Evaluators under similar physical stress conditions.

- Each device was evaluated by rested, slightly fatigued, and fatigued response personnel.
- Evaluators assessed each device while in Level A PPE in the three stress levels described above.

RAVUE Non-Motorized Extrication Devices Assessment Report

The Assessment Matrix in Table 7.1 below indicates the team assignments to the extrication devices for the three day assessment period.

Table 7.1. Extrication Devices Assessment Matrix

	Day 1			Day 2			Day 3		
	1 st Floor	2 nd Floor	1 st Floor	2 nd Floor	1 st Floor	2 nd Floor	2 nd Floor	2 nd Floor	2 nd Floor
	Team 1	Team 2	Team 3	Team 1	Team 2	Team 3	Team 1	Team 2	Team 3
	Lane 1	Lane 2	Lane 3	Lane 2	Lane 4	Lane 5	Lane 5	Lane 6	Lane 2
Carry 1	x				x				x
Carry 2	x				x				x
Carry 3	x				x				x
Carry 4			x	x				x	
Carry 5			x	x				x	
Drag 1		x				x	x		
Drag 2		x				x	x		
Drag 3		x				x	x		
Chair			x	x				x	

Three daily assessment segments were conducted at each lane in the hazardous materials training area of the Center for Domestic Preparedness (Building 61). During each segment, a different extrication device was used for extricating three non-ambulatory victims. After extricating the third victim in the assessment segment, the Evaluator team temporarily stopped assessment activities, hydrated themselves, and underwent a device debriefing. Following a one-hour rest and recovery period, the Evaluators performed a second and third extrication vignette using other extrication devices. Nine non-ambulatory victims were extricated using a each device during the three assessment days.

8. ASSESSMENT RESULTS

Overall, the Evaluators were able to successfully accomplish the mission in each scenario with each device. The numerical results are presented in Table 8.1 on the following page. Each device has three scores that represent the Evaluators' assessment of the device in the three evaluation priority categories (High, Medium, and Low). **Lower scores in the table indicates better device performance.**

Table 8.1. Results

Extrication Device	High Priority Criteria Score	Medium Priority Criteria Score	Low Priority Criteria Score
CombiCarrier®	38.36	61.64	151.77
Evacuation Chair	29.02	60.3	137.34
Folding Pole Litter	34.91	78.28	143.1
Henley Spinal Device	52.49	62.18	191.79
HMD Sked®	29.35	54.6	96.39
LifeSlider	36.41	67.98	159.84
Pro-Lite Spineboard®	39.32	54.48	117.93
RED SLED	40.99	67	137.73
Spineguard®	40.49	60.18	129.12

A. EVALUATOR RESPONSES - HIGH PRIORITY EVALUATION CRITERIA

Based on the Focus Group High Priority Criteria listed in Section 4.A, the scoring order was as depicted in the table at the right. Discussion of the evaluation criteria not able to be evaluated or device anomalies are contained in the paragraphs following.

- Ease of Use
- Lightweight
- Portability
- Durability
- Non-Reactive/ Reusable/Multiple Extrications
- Use in Multiple Environments
- Ease of Decontamination

High Priority Scoring Order
Evacuation Chair
HMD Sked®
Folding Pole Litter
LifeSlider
CombiCarrier®
Pro-Lite Spineboard®
Spineguard®
Red Sled
Henley Spinal Device

During the post assessment review, Evaluators commented that jurisdictions should consider using different type devices for different portions of the extrication. The suggested mission profile was to use one team with a drag-type device within the building, transferring the victim to another team and an extrication chair to descend the stairs. The third team with another device would be utilized to move the victim outside the building to the decontamination point.

B. EVALUATOR RESPONSES - MEDIUM PRIORITY EVALUATION CRITERIA

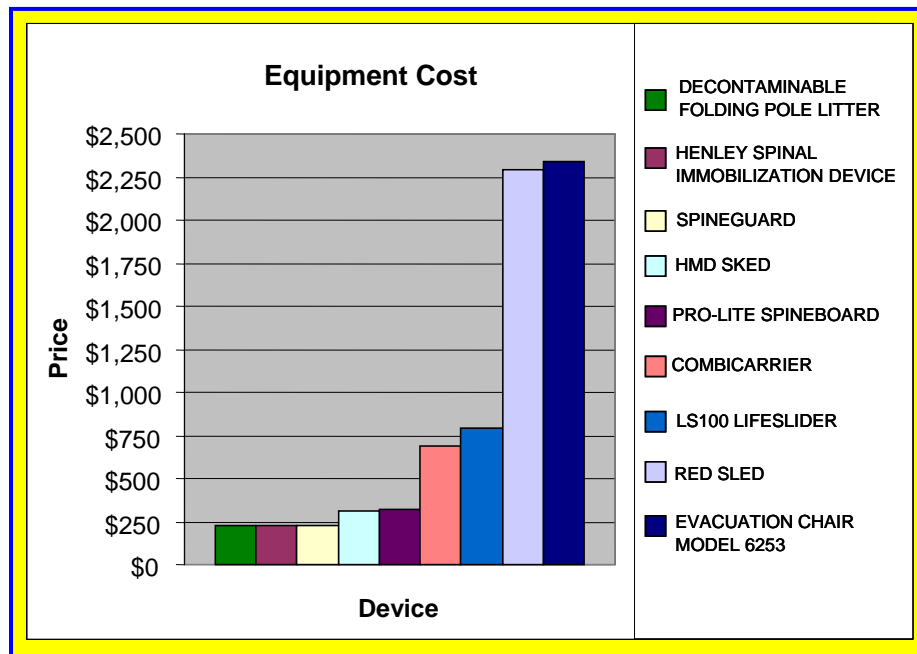
Based on the Focus Group Medium Priority Criteria listed in Section 4.B, the scoring order was as depicted in the table to the right. Cost was not scored by the Evaluators, but a comparison of equipment costs is provided below.

- Equipment Compatibility
- Cost
- Ease of Assembly
- Storage

Medium Priority Scoring Order
Pro-Lite Spineboard®
HMD Sked®
Spineguard®
Evacuation Chair
CombiCarrier®
Henley Spinal Device
LifeSlider
Red Sled
Folding Pole Litter

Cost was listed as being of medium importance to the Responder Focus Group determining the evaluation criteria. Therefore, it was included in the list above for completeness. The chart below illustrates the cost range among the pieces of extrication devices for informational purposes only.

Chart 8.1. Equipment Cost



The Pro-Lite Spineboard® was received without immobilization straps or a head immobilization restraint. To configure the device similarly to the other extrication devices and to configure the board for moving patients safely down stairs, straps and head restraints were procured at an additional cost of \$123.00. This raised the total

comparative cost of the Pro-Lite Spineboard® to \$324.00. It should also be noted that the Folding Pole Litter was not offered with straps.

C. EVALUATOR RESPONSES - LOW PRIORITY EVALUATION CRITERIA

Based on the Focus Group Low Priority Criteria listed in paragraph 4.C, the scoring order was as depicted in the table at the right.

- Interagency Compatibility
- Sizability (Infant/Adult)
- Simple/Clear Instructions or Diagrams
- Recoverability
- Disposability

Low Priority Scoring Order
HMD Sked®
Pro-Lite Spineboard®
Spineguard®
Evacuation Chair
Red Sled
Folding Pole Litter
CombiCarrier®
LifeSlider
Henley Spinal Device

There were no known environmental, hazardous, or recoverable components or materials on any of the devices that would require special handling or special recovery procedures.

9. COMPARATIVE ASSESSMENT CONCLUSIONS

Each of the extrication devices used in this assessment performed up to the manufacturer's advertised capabilities within the scenarios presented in the RAVUE assessment. That is to say that no unrealistic or extravagant claims were noted. Additionally, all of the devices were able to be successfully used by the Evaluators wearing Level A PPE. Therefore, all nine of the devices would be useful in extricating victims from a WMD mass casualty incident.

It is interesting to note that the two devices that Evaluators scored the highest in the high priority evaluation criteria were among both the least and the most expensive items. This tends to indicate that cost is not a reliable indicator of relative merit for the extrication devices, especially within the scenarios used in this assessment.

Assessment Summary

The Extrication Chair received the highest rating in the High Priority Criteria. For a jurisdiction that conducts frequent patient extrications from multi-story buildings, the extrication chair would prove valuable in day-to-day operations. However, in the mass casualty scenario represented in the RAVUE assessment, the evaluators gave the SKED® high marks in every Evaluation Criteria Category.

SKED®	
High Priority Criteria	#2
Medium Priority Criteria	#2
Low Priority Criteria	#1

It should also be recognized that most scenarios presented in this assessment involved descending no less than fifteen stairs. This resulted in several Evaluator comments after the assessment, stating that devices such as the Red Sled were not advertised by their manufacturer as being designed for stair extrication. Thus, according to some Evaluators, using this device in scenarios that required traversing stairs might be a misapplication of the devices' many other attributes. Consequently, the Evaluators recommended that a combination of extrication devices might best contribute to a mass casualty situation, tailored to the environment in which the extrications would occur.

Lastly, the single area that Evaluators believed manufacturers might easily improve upon is strap color coding and restraining strap configurations. Black straps with black buckles are nearly invisible when attempting to buckle them while wearing black protective gloves molded into the Level A suits. This is further complicated when operating under dimly lit conditions and looking through a fogged PPE face piece. Also the material used in the straps is important when considering ease of decontamination, because it needs to be easily handled by responders wearing Level A suits. Materials which would be easier to decontaminate might include loose weave synthetic materials resistant to agent absorption versus tight weave fiber materials such as cotton, polyester, or nylon.

10. CONCLUSION

The Evaluators involved in this assessment presented essential feedback on the equipment tested. The success of this assessment can be attributed to their dedication to improving Homeland Security capabilities. Their competence in this assessment will help to ensure a more efficient response should an event involving weapons of mass destruction present itself in the future.

